
Germ cells are required to maintain a stable sexual phenotype in adult zebrafish.

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Public Summary:

Sex in zebrafish is not determined by a major chromosomal locus, but instead relies on a mechanism that is influenced by a germ cell-derived signal, as animals that lack germ cells, or specifically oocytes, develop as phenotypic males. These data suggest that during primary sex determination, an oocyte-derived signal acts on the bipotential somatic gonad to promote the female-specific program. However, it is not known if germ cells are required only during the primary sex-determining window, or if they are required throughout adult life to maintain the female sexual phenotype. Here, we show that while wild-type zebrafish do not switch sex as adults, germ cell-depleted adult females readily convert to a male phenotype. Notably, when oocytes are depleted, but germline stem cells remain, adult females revert to sperm-producing males, indicating that a germ cell-derived signal acts on the somatic gonad to promote female development directly or indirectly by repressing male-specific gene expression. These results also confirm that signals from the somatic gonad in turn ensure that the sex appropriate gamete is produced.

Scientific Abstract:

Sex in zebrafish is not determined by a major chromosomal locus, but instead relies on a mechanism that is influenced by a germ cell-derived signal, as animals that lack germ cells, or specifically oocytes, develop as phenotypic males. These data suggest that during primary sex determination, an oocyte-derived signal acts on the bipotential somatic gonad to promote the female-specific program. However, it is not known if germ cells are required only during the primary sex-determining window, or if they are required throughout adult life to maintain the female sexual phenotype. Here, we show that while wild-type zebrafish do not switch sex as adults, germ cell-depleted adult females readily convert to a male phenotype. Notably, when oocytes are depleted, but germline stem cells remain, adult females revert to sperm-producing males, indicating that a germ cell-derived signal acts on the somatic gonad to promote female development directly or indirectly by repressing male-specific gene expression. These results also confirm that signals from the somatic gonad in turn ensure that the sex appropriate gamete is produced.

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